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Strategic Reconfiguration of Decision Authority in AI-Driven Global Supply Chains under Geopolitical Fragmentation: Developing Geo-Algorithmic Decision Authority Theory (GADAT)

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ABSTRACT: Artificial intelligence (AI) is now deeply embedded in global supply-chain decision-making, automating tasks ranging from demand forecasting to supplier qualification and logistics planning. Alongside this technological shift, geopolitical fragmentation, expressed through sanctions, data localization mandates, new regional trade blocs, and friend-shoring has reshaped the institutional environment in which firms operate. Existing research examines AI delegation as an efficiency-enhancing mechanism and geopolitical fragmentation as a structural risk, but the two forces have rarely been theorized together. This conceptual paper develops an integrative theoretical framework**, that is, Algorithmic Decision Authority Theory (GADAT)**, to explain how geopolitical fragmentation fundamentally shifts AI delegation from an efficiency-centric architecture toward a legitimacy-centric architecture. Drawing on Resource Dependence Theory, Institutional Theory, Information Processing Theory, and Dynamic Capabilities, the paper introduces several new constructs: *Political–Algorithmic Misalignment (PAM)*, *Geo-Institutional Opacity (GIO)*, *Legitimacy-Centric Delegation (LCD)*, *Algorithmic Legitimacy Buffering (ALB)*, and *Delegation Adjustment Capability (DAC)*. The theory identifies three core mechanisms—coercive legitimacy pressures, political-triggered information constraints, and institutional heterogeneity—through which geopolitical fragmentation reshapes the locus, granularity, and accountability of decision authority in AI-enabled supply chains. The paper then articulates a model predicting four structural outcomes: *recentralized authority*, *federated hybrid authority*, *trust-partitioned authority*, and *insulated algorithmic authority*. Eight propositions link these configurations to supply-chain resilience, performance, and multinational adaptability. A dedicated section examines alternative theoretical explanations, transaction cost economics, agency theory, classic information processing models, and traditional supply-chain governance perspectives—to demonstrate the added value of GADAT. The paper concludes with a research agenda for empirical testing and proposes managerial implications for configuring AI decision rights in politically heterogeneous environments.

KEYWORDS: Artificial intelligence; geopolitical fragmentation; decision authority; institutional legitimacy; resource dependence; information processing; dynamic capabilities; supply chain resilience; global operations.

1. INTRODUCTION

Global supply chains are being reorganized at a pace unseen since the end of the Cold War. The combination of rising geopolitical tensions, export controls, technology sanctions, regionalized trade blocs, and politicized data infrastructures is fundamentally altering how firms distribute decision authority across their networks. At the same time, the rapid diffusion of artificial intelligence (AI)—particularly predictive, autonomous, and generative algorithmic systems—has shifted operational decision making toward automated and semi-automated routines. For firms whose supply chains rely on complex, multi-tier data flows, the tension between *algorithmic delegation* and *geopolitical fragmentation* is no longer an abstract concern; it is a daily operational constraint.

Yet existing supply chain management (SCM) theories treat these two forces, AI autonomy and geopolitical pressure, as if they were independent. Digital supply chain research typically assumes a world of frictionless data exchange and efficiency-driven decision architecture (Ivanov & Dolgui, 2022; Wang et al., 2021). Geopolitical research, by contrast, centers on state-level coercion, sanctions, and legitimacy concerns, often overlooking the algorithmic infrastructures through which firms actually coordinate

operational decisions (Gereffi, 2019; Shih, 2020). What is missing is an integrated theoretical explanation for how firms restructure decision authority when *algorithms* and *geopolitics* collide.

This paper advances the argument that geopolitical fragmentation fundamentally shifts AI delegation from efficiency-centric to legitimacy-centric decision authority architectures. In other words, while AI-enabled supply chains were initially built to optimize speed, cost, and accuracy, the new geopolitical environment forces firms to redesign algorithmic decision rights around concerns of legitimacy, compliance, political exposure, data sovereignty, and external scrutiny. Delegating decisions to AI is no longer primarily a question of operational performance. it is a question of organizational and institutional survival.

The heart of the problem is theoretical. Current SCM literature lacks constructs and causal mechanisms explaining *how* and *why* decision authority migrates between humans, AI systems, and organizational units under political and regulatory pressure. Transaction cost economics offers a partial economic view but cannot explain political legitimacy dynamics. Dynamic capabilities theory explains adaptation but not authority redistribution. Resource dependence theory highlights external constraints but does not account for algorithmic autonomy. Institutional theory captures legitimacy pressures but not technological delegation. Information processing theory explains decision structures but not political coercion.

2. THEORETICAL FOUNDATIONS

Explaining how geopolitical fragmentation reshapes AI-based decision authority requires a theoretical foundation capable of linking external pressures, organizational legitimacy, information-processing demands, and adaptive capability development. No single theory offers a sufficient explanation. Instead, this paper integrates four foundational perspectives. Resource Dependence Theory, Institutional Theory, Information Processing Theory, and Dynamic Capabilities, to build the conceptual core of Geo-Algorithmic Decision Authority Theory (GADAT)**.**

Each theory offers a distinct causal lens:

- **Resource Dependence Theory (RDT)** explains how geopolitical actors constrain firms' choices through power asymmetries and control over critical resources.
- **Institutional Theory (IT)** highlights legitimacy pressures, coercive regulation, and normative expectations that shape how algorithmic authority is accepted or rejected.
- **Information Processing Theory (IPT)** identifies structural requirements for managing uncertainty and the allocation of decision rights across technological and human agents.
- **Dynamic Capabilities (DCV)** explain how firms reconfigure AI–human decision architectures in response to environmental change.

Bringing these together allows for a more comprehensive model of how firms shift from efficiency-centric to legitimacy-centric AI delegation.

2.1 Resource Dependence Theory and Geopolitical Power

Resource Dependence Theory (Pfeffer & Salancik, 1978) argues that organizations depend on external actors for critical resources, and these dependencies expose firms to power and control. In an era of geopolitical fragmentation, "critical resources" include not only physical inputs but also data access, digital infrastructures, AI training pipelines, cloud environments, semiconductor supply chains, and cross-border data transmission channels**.** Recent work shows that governments are increasingly using supply chain chokepoints, such as semiconductor export controls, cloud infrastructure regulations, or data localization laws, as instruments of geopolitical strategy (Farrell & Newman, 2019; Lundan & Van Assche, 2021). AI-enabled supply chains, which rely on globally distributed data signals, become especially vulnerable to this type of state intervention.

Thus, RDT implies that firms must restructure decision authority to mitigate political exposure arising from:

- Dependence on politically regulated data sources
- Reliance on jurisdictionally contested AI infrastructures
- Exposure to extraterritorial sanctions
- Cross-border digital dependence asymmetries

This creates the first theoretical mechanism in GADAT: the higher the resource dependence on geopolitically contested digital assets, the more firms realign algorithmic decision rights to retain autonomy. In short, RDT provides the power-based logic explaining why geopolitical forces constrain algorithmic delegation.

2.2 Institutional Theory: Legitimacy and Coercive Pressures

Institutional Theory (Meyer & Rowan, 1977; Scott, 2014) provides a complementary explanation: organizations do not merely respond to power; they also respond to **legitimacy pressures**. When social expectations, regulatory frameworks, and political narratives begin to question AI's neutrality, transparency, or sovereignty, firms must redesign their decision authority structures accordingly. Several recent studies indicate that AI governance is increasingly shaped by institutional forces—privacy regulation,

ethical guidelines, data protection mandates, and compliance scrutiny (Benbya et al., 2021; Martin, Shilton & Smith, 2019). Under such pressures, firms begin to treat AI delegation as a legitimacy-sensitive organizational choice, not merely an efficiency calculation. This explains why firms operating across geopolitical blocs—Europe, China, the U.S., India—may use different AI delegation architectures despite identical operational needs. Institutional Theory predicts:

- **Coercive pressures** (laws, sanctions, mandatory audits)
- **Normative pressures** (industry standards, professional expectations)
- **Cultural-cognitive pressures** (societal concerns about foreign AI systems)

All push firms toward legitimacy-centric delegation, where decisions are allocated to AI only when the resulting architecture preserves political acceptability. Institutional Theory therefore anchors the second core mechanism in GADAT:delegating authority to AI becomes a legitimacy-seeking behavior under geopolitical fragmentation.

2.3 Information Processing Theory and Decision Architecture Complexity

Information Processing Theory (Galbraith, 1974; Tushman & Nadler, 1978) focuses on how organizations distribute decision rights to handle uncertainty. Digital supply chain systems increase information-processing capacity dramatically by enabling real-time data flows, predictive analytics, and AI-assisted decision routines (Ivanov & Dolgui, 2022; Wamba et al., 2020). In a stable environment, IPT predicts that firms will shift decision authority toward systems that can process more information with less delay—typically, AI. But geopolitical fragmentation *increases environmental uncertainty in ways that AI is not necessarily designed to manage*. Examples include:

- sudden regulatory changes that invalidate algorithmic routines,
- opaque geopolitical risk signals that algorithms cannot interpret,
- politically constrained data sources that reduce informational richness,
- multi-tier suppliers operating under conflicting political mandates.

IPT suggests that when uncertainty increases beyond the system's processing capacity, organizations must *reconfigure their decision structure*. Under fragmentation, firms may:

- pull decisions back from autonomous AI systems,
- shift authority to human oversight units,
- introduce hybrid decision routines with political checkpoints,
- decentralize authority to regional nodes to meet local legitimacy constraints.

Thus, IPT provides the third mechanism in GADAT: geopolitical uncertainty forces a redesign of AI–human authority allocation to match processing requirements.

2.4 Dynamic Capabilities and Reconfiguration of AI–Human Authority

Dynamic Capabilities (Teece, Peteraf & Leih, 2016; Teece, 2007) explain how firms sense, seize, and reconfigure resources in rapidly changing environments. In AI-enabled supply chains, dynamic capabilities manifest as:

- the ability to adapt algorithmic routines,
- the capability to redesign decision structures,
- the capacity to integrate geopolitical intelligence into digital systems,
- the orchestration of data, talent, and technological architecture.

Recent studies suggest that digital transformation introduces new forms of dynamic capabilities, data governance capabilities (Ransbotham et al., 2020), algorithmic learning capabilities (Benbya et al., 2021), and digital resilience capabilities (Queiroz & Wamba, 2021). Under geopolitical fragmentation, firms must develop Algorithmic Buffering Capabilities (ABC), a dynamic capability that protects AI-driven processes from geopolitical disruptions. These capabilities include:

- modularizing AI decision chains to meet jurisdictional requirements,
- insulating sensitive data flows,
- building redundancy in algorithmic infrastructures,
- ensuring human override,
- designing alternative political-compliant decision pathways.

Thus, DCV completes the fourth mechanism in GADAT, adaptive reconfiguration of AI delegation emerges as a dynamic capability shaped by geopolitical uncertainty.

2.5 Why an Integrative Theoretical Approach Is Necessary

Individually, each theory explains only part of the phenomenon:

- **RDT** explains *external dependence and power constraints*.
- **IT** explains *legitimacy and institutional conformity*.

- **IPT** explains *information-processing requirements and decision architecture*.
- **DCV** explains *capability-based adaptation and reconfiguration*.

No single theory can fully explain why firms shift from giving AI more authority for efficiency reasons to reclaiming authority for legitimacy reasons. GADAT synthesizes the four theories to explain:
(1) Why geopolitical pressures matter (RDT + IT)
(2) How decision authority changes (IPT)
(3) How firms adapt and shield AI systems (DCV)
This sets the foundation for the new model.

3. Emerging Phenomenon and Construct Development

Global supply chains are undergoing a structural shift as artificial intelligence (AI) increasingly mediates forecasting, sourcing, logistics, supplier evaluation, and multi-tier visibility. Under stable geopolitical conditions, firms typically delegate decision authority to AI for efficiency: faster processing, lower costs, improved accuracy, and scalable coordination (Culot et al., 2024; Ivanov & Dolgui, 2022). Yet, an emerging pattern across industries suggests that delegating decision authority to AI is no longer driven purely by efficiency considerations**.** Instead, geopolitical fragmentation has elevated **l**egitimacy, political, regulatory, and societal into a central factor determining whether, where, and how firms rely on algorithmic decision agents. Across multinational corporations (MNCs), managers now face a new strategic dilemma:
How to reconcile the efficiency logic of AI with the legitimacy logic imposed by geopolitical contestation? This section defines the emerging phenomenon and introduces the core constructs that form the building blocks of Geo-Algorithmic Decision Authority Theory (GADAT)**.**

3.1 The Emerging Global Phenomenon: Legitimacy-Centric Algorithmic Delegation

Geopolitical fragmentation now manifests through:

- technology and data sovereignty laws (Lundan & Van Assche, 2021),
- AI-specific regulatory regimes (Martin et al., 2019; Floridi, 2021),
- trade sanctions and export controls (Farrell & Newman, 2019),
- friend-shoring and political alignment-based sourcing (Evenett & Fritz, 2023),
- contested digital infrastructures (Pohle & Thiel, 2020),
- and rising scrutiny of foreign technologies (Chen & Modi, 2020).

These developments create an environment where: AI-led decisions are judged not only by efficiency but also by political acceptability, institutional alignment, and cross-border legitimacy. Consider illustrative patterns observed globally:
Case 1: European firms increasingly limit automated decision-making in supply chains that involve U.S. or Chinese data infrastructures due to GDPR, AI Act compliance, and concerns about "algorithmic sovereignty" (Pohle & Thiel, 2020).
Case 2: U.S. firms reconfigure decision authority in semiconductor and pharmaceutical supply chains to comply with export controls, national security reviews, and critical technology regulations (Evenett & Fritz, 2023).
Case 3: Asian MNCs develop dual decision systems: one algorithmic for domestic ecosystems, another human-led for politically sensitive global operations (Chen & Modi, 2020).
These patterns illustrate a critical shift; the politics of data and algorithms now shape the internal distribution of supply chain decision authority. This shift is qualitatively different from previous waves of supply chain disruption (natural disasters, pandemics, cyberattacks). In those cases, AI delegation often expanded to compensate for uncertainty. Under geopolitical fragmentation, however, AI delegation contracts in politically contested areas and expands only in legitimacy-compatible zones. This inversion **f**rom efficiency-centric to legitimacy-centric delegation is the core phenomenon GADAT seeks to explain.

3.2 Core Constructs of Geo-Algorithmic Decision Authority Theory (GADAT)

GADAT proposes **six new constructs** and links them to four established theories. These constructs explain how and why firms reconfigure AI–human decision architectures under geopolitical fragmentation.
Construct 1: Geopolitical Digital Exposure (GDE)
Definition:
The degree to which a firm's AI-enabled supply chain depends on data, infrastructures, suppliers, or technologies that fall within contested geopolitical jurisdictions.
Theoretical grounding:
Resource Dependence Theory (external political control); Institutional Theory (coercive pressures).
Examples:

- Reliance on cloud platforms regulated by foreign governments
- AI models trained on data subject to extraterritorial jurisdiction

- Suppliers located in sanction-prone sectors

Why it matters:
High GDE magnifies legitimacy risks, increasing scrutiny of algorithmic decisions.
Construct 2: Algorithmic Legitimacy Vulnerability (ALV)

Definition:
The susceptibility of algorithmic decisions to be challenged, constrained, or deemed illegitimate by political, regulatory, or social actors.

Theoretical grounding:
Institutional Theory (legitimacy, compliance obligations).
Examples:

- AI routing decisions that violate regional data localization requirements
- Supplier risk models trained using restricted or politically sensitive datasets
- Automated contract awards in sectors with national security oversight

Why it matters:
ALV determines the extent to which firms can safely delegate authority to AI without institutional backlash.
Construct 3: Decision Authority Locus Shift (DALS)

Definition:
Reallocation of decision rights between global headquarters, regional units, human managers, and AI systems in response to geopolitical pressures.

Theoretical grounding:
Information Processing Theory (structural redesign), RDT (shifting control).
Examples:

- Moving supplier-selection authority from global AI models to regional human officers
- Building regional AI engines that operate independently of global data pools

Why it matters:
DALS explains organizational redesign of decision structures under fragmentation.
Construct 4: Algorithmic Buffering Capabilities (ABC)
Definition:
A firm's ability to modify, shield, or reconfigure AI systems to remain operational and legitimate under geopolitical constraints.
Theoretical grounding:
Dynamic Capabilities (reconfiguration, sensing, seizing).
Examples:

- Dual AI governance architectures
- Redundant algorithmic pipelines
- Modular AI models designed for jurisdictional switching

Why it matters:
ABC is the adaptive capability that enables strategic resilience.
Construct 5: Legitimacy-Centric Delegation (LCD)
Definition:
Delegating decision authority to AI only when it enhances—or at least does not threaten—geopolitical, regulatory, and institutional legitimacy.
Theoretical grounding:
Institutional Theory + RDT, extending into a new integrative logic.
Examples:

- Allowing AI autonomy only in low-regulation geographies
- Restricting algorithmic sourcing decisions in sanction-prone countries

Why it matters:
LCD is the centerpiece of the new theory: the shift from efficiency-first to legitimacy-first delegation.

Construct 6: Geo-Algorithmic Ambidexterity (GAA)

Definition:

A firm's capability to simultaneously use AI autonomy in legitimacy-safe zones while employing human or hybrid decision architectures in politically sensitive zones.

Theoretical grounding:

Dynamic Capabilities (strategic flexibility); IPT (differentiated information structures).

Examples:

- Running global AI for logistics optimization while using human-led decisions for suppliers in politically sensitive regions
- Maintaining two algorithmic risk models: domestic unrestricted and cross-border compliant

Why it matters:

GAA explains how firms balance efficiency and legitimacy across geopolitical contexts.

3.3 Linking the Constructs: The Geo-Algorithmic Decision Shift

The constructs are interrelated through a cascading mechanism.

Step 1: Rising Geopolitical Digital Exposure (GDE)

Exposure to politically contested digital environments increases uncertainty and dependence on jurisdictionally sensitive resources.

Step 2: Elevated Algorithmic Legitimacy Vulnerability (ALV)

Politically exposed AI decisions face higher institutional scrutiny and legitimacy risk.

Step 3: Triggering a Decision Authority Locus Shift (DALS)

Firms respond by repositioning authority between AI and humans, global and regional nodes.

Step 4: Activation of Algorithmic Buffering Capabilities (ABC)

Capabilities are deployed to redesign architectures—either insulating AI or hybridizing decision flows.

Step 5: Adoption of Legitimacy-Centric Delegation (LCD)

AI receives authority selectively, contingent on legitimacy rather than efficiency.

Step 6: Move Toward Geo-Algorithmic Ambidexterity (GAA)

Over time, firms develop the ability to operate dual authority structures tailored to geopolitical variance.

This causal chain forms the basis of the model introduced in Section 4.

3.4 Positioning the Phenomenon Within Past Research

What existing literature explains well:

- AI improves supply chain visibility and decision quality (Ivanov & Dolgui, 2022; Wamba et al., 2020).
- Political risks affect sourcing, networks, and resilience (Evenett & Fritz, 2023).
- Institutional legitimacy is central to technology adoption (Benbya et al., 2021).
- Uncertainty dictates information-processing structure (Tushman & Nadler, 1978).

What existing literature does *not* explain

No existing research explains:

1. Why firms retract decision authority from AI despite operational benefits
2. Why AI delegation varies across geopolitical blocs
3. Why legitimacy, rather than efficiency now drives AI decision allocation
4. How firms build capabilities to buffer AI against geopolitical disruption
5. Why firms develop dual (ambidextrous) decision systems across regions

These gaps justify the development of a new integrative theory.

3.5 The Need for a New Theory

The phenomenon described above cannot be fully explained by RDT, Institutional Theory, IPT, or DCV alone. Each offers essential but incomplete insights.

- RDT explains geopolitical power but not AI delegation.
- Institutional Theory explains legitimacy but not digital authority structures.
- IPT explains decision architecture but not political constraints.
- DCV explains adaptation but not legitimacy-driven authority reallocation.

The emergent phenomenon legitimacy-centric algorithmic delegation under geopolitical fragmentation requires a theory that integrates power, legitimacy, information-processing, and dynamic capabilities.

Therefore, this paper introduces:

Geo-Algorithmic Decision Authority Theory (GADAT)

Strategic Reconfiguration of Decision Authority in AI-Driven Global Supply Chains under Geopolitical Fragmentation: Developing Geo-Algorithmic Decision Authority Theory (GADAT)

A new integrative theory that explains how and why firms reconfigure AI–human decision architectures under geopolitical fragmentation.

4. The Geo-Algorithmic Decision Authority Model and Propositions

This section formalizes the conceptual framework introduced in Section 3. The Geo-Algorithmic Decision Authority Theory (GADAT) integrates Resource Dependence Theory, Institutional Theory, Information Processing Theory, and Dynamic Capabilities to explain how AI delegation in global supply chains is reconfigured under geopolitical fragmentation. The model introduces mechanisms, causal relationships, and testable propositions, providing a basis for future empirical research.

4.1 Conceptual Model Overview

GADAT posits that geopolitical fragmentation triggers a shift from efficiency-centric to legitimacy-centric AI delegation through three interrelated mechanisms:

1. Geopolitical Digital Exposure (GDE) — Dependency on politically contested resources increases organizational vulnerability.
2. Algorithmic Legitimacy Vulnerability (ALV) — Political and institutional pressures create risks for algorithmic decision outcomes.
3. Decision Authority Locus Shift (DALS) — Firms respond by reallocating decision authority across AI, human managers, and organizational units.

Algorithmic Buffering Capabilities (ABC) and Geo-Algorithmic Ambidexterity (GAA) act as dynamic moderators, allowing firms to balance efficiency and legitimacy across regions.

Figure 1 Placeholder: *Geo-Algorithmic Decision Authority Model illustrating the causal pathways from GDE and ALV to DALS, moderated by ABC and resulting in GAA.*

4.2 Mechanisms Linking Geopolitics to AI Delegation

4.2.1 Geopolitical Digital Exposure (GDE)

GDE captures how dependence on foreign-controlled AI infrastructures, cloud services, or cross-border data increases organizational exposure to sanctions, export controls, and regulatory divergence (Farrell & Newman, 2019; Lundan & Van Assche, 2021). High GDE creates pressure to modify algorithmic decision authority to maintain operational continuity and legitimacy.

Proposition 1 (P1)**:** *Higher geopolitical digital exposure is positively associated with increased reallocation of AI decision authority toward human oversight and regional autonomy.*

4.2.2 Algorithmic Legitimacy Vulnerability (ALV)

ALV measures the susceptibility of AI decisions to legitimacy challenges from regulatory, political, or societal stakeholders (Martin et al., 2019; Benbya et al., 2021). When ALV is high, firms prioritize legitimacy over efficiency, selectively delegating decision rights to AI only when politically safe.

Proposition 2 (P2): *Greater algorithmic legitimacy vulnerability increases the adoption of legitimacy-centric AI delegation practices.*

4.2.3 Decision Authority Locus Shift (DALS)

DALS operationalizes how firms reallocate decision rights along three dimensions:

1. Locus**:** Centralized headquarters versus decentralized regional units.
2. Granularity**:** Strategic (sourcing, procurement) versus operational (inventory, routing) decisions.
3. Accountability: Human managers versus algorithmic systems.

Reallocation is driven by a combination of GDE and ALV, resulting in hybrid authority structures.

Proposition 3 (P3): *Decision authority shifts toward hybrid or regionally autonomous architectures as a function of combined GDE and ALV.*

4.3 Dynamic Capabilities and Algorithmic Buffering

Algorithmic Buffering Capabilities (ABC) represent the firm's ability to shield AI from geopolitical disruption. ABC manifests in modularized AI pipelines, redundant data paths, dual governance structures, and human override mechanisms (Queiroz & Wamba, 2021; Ransbotham et al., 2020).

Proposition 4 (P4): *Firms with stronger algorithmic buffering capabilities are better able to maintain AI delegation in politically exposed regions while preserving legitimacy.*

4.4 Geo-Algorithmic Ambidexterity (GAA)

Geo-Algorithmic Ambidexterity (GAA) reflects the firm's ability to simultaneously operate:

- AI-dominated efficiency zones in politically stable regions, and

- Human or hybrid-dominated legitimacy zones in politically sensitive regions.

This dual approach allows MNCs to balance efficiency, resilience, and institutional legitimacy.

Proposition 5 (P5): *Higher geo-algorithmic ambidexterity enhances overall supply chain resilience and performance under geopolitical fragmentation.*

4.5 Integrated Model Logic

The causal logic of GADAT can be summarized:

1. Environmental Trigger: Geopolitical fragmentation increases GDE and ALV.
2. Authority Reconfiguration**:** Firms implement DALS to reallocate decision rights.
3. Capability Mediation: ABC enables safe AI deployment and hybrid structures.
4. Strategic Outcome: GAA provides flexibility to maintain operational efficiency while meeting legitimacy requirements.

Figure 2 Placeholder**:** *Flow diagram showing GDE and ALV → DALS → ABC → GAA → Performance outcomes.*

4.6 Strategic Implications of the Model

- MNCs can optimize AI deployment by mapping geopolitical exposure to delegation decisions.
- Investment in algorithmic buffering capabilities is essential for maintaining legitimacy without sacrificing efficiency.
- Dual architectures (GAA) allow firms to navigate contrasting regional norms, regulations, and political sensitivities.

4.7 Testable Propositions Summary

Proposition	Mechanism	Expected Outcome
P1	GDE → DALS	Greater regional/human authority allocation in politically exposed regions
P2	ALV → LCD	Increased legitimacy-centric AI delegation
P3	GDE + ALV → DALS	Hybrid authority structures emerge
P4	ABC moderates DALS	AI can retain authority safely in high-risk zones
P5	GAA → Performance	Ambidextrous AI–human deployment enhances resilience, efficiency, and legitimacy

4.8 Practical Implications

1. Decision Mapping**:** Firms should assess geopolitical digital exposure to identify high-risk AI decisions.
2. Hybrid Governance Design**:** Integrate human oversight where legitimacy vulnerability is high.
3. Capability Building**:** Invest in ABC to enable flexible AI architectures.
4. Ambidextrous Operations: Tailor AI delegation across regions to balance efficiency and legitimacy.

4.9 Summary of Section 4

Section 4 formalizes the conceptual logic of GADAT:

- Introduces six interrelated constructs.
- Explains how geopolitical fragmentation triggers a shift from efficiency to legitimacy in AI delegation.
- Provides five testable propositions.
- Integrates four theoretical lenses into a unified explanatory model.

GADAT therefore provides both **theoretical insight** and **managerial guidance** for navigating AI-enabled supply chains in geopolitically fragmented environments.

5. Alternative Explanations and Rival Theories

While GADAT provides a comprehensive explanation for legitimacy-driven shifts in AI delegation under geopolitical fragmentation, it is essential to consider alternative explanations and rival theoretical perspectives. This strengthens the conceptual robustness of the model and clarifies its unique contribution. Three rival perspectives are particularly relevant: Transaction Cost Economics (TCE), Sociotechnical Systems Theory (STS), and Contingency Theory.

5.1 Transaction Cost Economics (TCE)

Transaction Cost Economics (Williamson, 1979, 1985) offers a powerful framework for explaining governance decisions based on the costs of exchange, monitoring, and opportunism. TCE would predict that firms adjust AI delegation primarily to **minimize transaction costs** under uncertainty. For instance, decisions might be centralized when cross-border political risk raises monitoring costs or decentralized when opportunistic behavior by local suppliers threatens efficiency.

Critical Evaluation:

While TCE explains some reallocation of authority, it cannot fully account for legitimacy concerns. Specifically:

- TCE focuses on cost minimization rather than institutional or political legitimacy.
- Geopolitical sanctions or normative pressures may compel firms to retain human oversight even when AI would reduce costs, a behavior inconsistent with TCE predictions.
- TCE does not explicitly address information-processing limitations introduced by AI opacity or complex global data flows.

Thus, although TCE provides a partial economic rationale, it cannot capture the full legitimacy-centric logic that GADAT highlights.

5.2 Sociotechnical Systems Theory (STS)

STS emphasizes the joint optimization of social and technical subsystems within organizations (Trist & Bamforth, 1951; Pasmore et al., 1982). Applied to AI-enabled supply chains, STS might suggest that AI delegation is reconfigured to optimize the interaction between human operators and algorithms, ensuring that social norms, team dynamics, and technical capabilities are aligned.

Critical Evaluation:

STS offers useful insights into human–AI interaction and local adaptation but falls short in explaining geopolitical influences:

- STS focuses on internal social-technical fit, neglecting exogenous political or institutional pressures**.**
- It predicts authority shifts as a function of team efficiency and social satisfaction, but not as a response to extrinsic legitimacy threats from states, trade blocs, or regulators.
- STS does not provide mechanisms for dynamic capability-based reconfiguration of AI under rapidly changing geopolitical conditions.

Hence, while STS complements GADAT in explaining human–AI integration, it does not address the legitimacy-driven, geopolitically contingent reallocation of authority central to this theory.

5.3 Contingency Theory

Contingency Theory (Lawrence & Lorsch, 1967; Donaldson, 2001) posits that organizational structure and decision authority should align with environmental conditions such as uncertainty, complexity, or technology. A contingency perspective would predict that firms adjust AI delegation according to the level of environmental uncertainty, the scale of supply chain operations, or the complexity of data flows.

Critical Evaluation:

- Contingency Theory explains some reallocation under uncertainty but does not explicitly integrate political, institutional, and legitimacy dimensions.
- It primarily addresses efficiency and fit, assuming rational adaptation to uncertainty, rather than legitimacy-driven constraints imposed by governments or societal expectations.
- Contingency theory does not distinguish between different types of uncertainty (economic, geopolitical, institutional) or capture the role of algorithmic opacity in decision-making.

Therefore, although contingency perspectives predict structural shifts under uncertainty, they cannot fully account for the observed shift from efficiency-centric to legitimacy-centric AI delegation**.**

5.4 How GADAT Addresses These Limitations

GADAT overcomes the limitations of TCE, STS, and Contingency Theory by:

1. Integrating legitimacy and political exposure**:** Unlike TCE and Contingency Theory, GADAT explicitly models algorithmic legitimacy vulnerability (ALV**)** and geopolitical digital exposure (GDE) as causal mechanisms.
2. Accounting for dynamic adaptation**:** Unlike STS, GADAT incorporates Algorithmic Buffering Capabilities (ABC)**,** showing how firms actively reconfigure AI authority under changing environmental pressures.
3. Differentiating efficiency and legitimacy objectives: GADAT uniquely distinguishes between efficiency-centric **and** legitimacy-centric delegation, offering a novel explanation for authority reallocation even when operational efficiency would favor AI.
4. Explaining dual or ambidextrous structures**:** By introducing Geo-Algorithmic Ambidexterity (GAA**)**, GADAT explains why firms simultaneously pursue efficiency in some regions and legitimacy in others, a pattern not predicted by rival theories.

Figure 3 Placeholder**:** *Comparative mapping of GADAT versus TCE, STS, and Contingency Theory, highlighting explanatory coverage and unique contributions.*

5.5 Potential Overlaps and Complementarities

Although GADAT surpasses the explanatory power of the rival theories in the context of geopolitically fragmented AI supply chains, there are complementary insights that can be integrated:

- **TCE:** Provides economic justification for authority reallocation under cost-sensitive conditions.
- **STS:** Offers guidance for designing human–AI interfaces and hybrid decision routines.

- Contingency Theory**:** Reinforces the principle that **environmental fit matters**, especially under varying levels of political and operational complexity.

By selectively integrating insights from these perspectives, GADAT maintains **parsimony while** capturing the multidimensional nature of geopolitical, technological, and institutional pressures.

5.6 Implications for Theory Validation

Considering alternative explanations is essential for empirical research design:

1. Operationalizing constructs**:** Researchers can measure GDE, ALV, DALS, ABC, LCD, and GAA independently from cost, social fit, or general uncertainty, isolating legitimacy-driven mechanisms.
2. Rival model testing**:** Comparative studies can test GADAT against TCE- or Contingency-based models to demonstrate superior explanatory power regarding AI authority reallocation.
3. Boundary conditions**:** Identifying contexts where TCE, STS, or Contingency Theory might still hold helps refine GADAT's domain—primarily MNCs with AI-enabled global supply chains under geopolitical fragmentation**.**

5.7 Summary

This section shows that:

- **TCE** explains economic efficiency but ignores legitimacy pressures.
- **STS** explains human–AI integration but ignores political constraints.
- **Contingency Theory** explains structural adaptation under uncertainty but does not account for legitimacy-driven authority reallocation.
- **GADAT** integrates RDT, Institutional Theory, IPT, and DCV to explain why AI delegation shifts from efficiency to legitimacy focus, and how firms develop adaptive capabilities to maintain dual objectives.

By situating GADAT relative to rival theories, the model is conceptually robust, clearly delineates its unique contribution, and provides a defensible foundation for empirical testing.

6. Contributions, Managerial Implications, and Future Research

This section synthesizes the conceptual and theoretical contributions of GADAT, outlines actionable managerial guidance, and proposes avenues for empirical research.

6.1 Theoretical Contributions

The primary contribution of this paper is the development of Geo-Algorithmic Decision Authority Theory (GADAT)**, a** new integrative theory explaining the legitimacy-driven reconfiguration of AI delegation in global supply chains under geopolitical fragmentation. This contribution spans four dimensions:

6.1.1 Integrative Theory Development

GADAT uniquely integrates four complementary theoretical lenses:

1. Resource Dependence Theory (RDT**):** Explains external constraints imposed by geopolitically controlled digital resources.
2. Institutional Theory (IT): Captures coercive, normative, and cultural legitimacy pressures shaping AI delegation.
3. Information Processing Theory (IPT): Illuminates structural reconfiguration in response to uncertainty and algorithmic complexity.
4. Dynamic Capabilities (DCV): Demonstrates how firms sense, seize, and reconfigure AI authority to balance efficiency and legitimacy.

This integration allows GADAT to bridge gaps between efficiency-driven and legitimacy-driven decision-making**,** offering a more complete explanation than single-theory approaches.

6.1.2 New Constructs and Mechanisms

GADAT introduces **six novel constructs** that operationalize the underlying phenomenon:

1. Geopolitical Digital Exposure (GDE)
2. Algorithmic Legitimacy Vulnerability (ALV)
3. Decision Authority Locus Shift (DALS)
4. Algorithmic Buffering Capabilities (ABC)
5. Legitimacy-Centric Delegation (LCD)
6. Geo-Algorithmic Ambidexterity (GAA)

These constructs provide measurable dimensions to capture how, where, and why AI delegation shifts in response to geopolitical and institutional pressures. They extend the boundaries of current theory in digital supply chain management by explicitly linking algorithmic autonomy to legitimacy, a factor largely ignored in prior research.

6.1.3 Conceptualizing Legitimacy-Centric AI Delegation

Existing studies on AI-enabled supply chains predominantly frame AI delegation as an efficiency-enhancing mechanism (Culot et al., 2024; Ivanov & Dolgui, 2022). GADAT demonstrates that legitimacy considerations can override efficiency imperatives**,** leading to hybrid governance architectures where AI autonomy is selectively constrained. This shift from efficiency-centric to legitimacy-centric delegation represents a significant conceptual advance in understanding AI-enabled decision-making in complex global environments.

6.1.4 Testable Propositions for Future Research

GADAT articulates five testable propositions that link the new constructs to outcomes:

- P1: High GDE → increased human/regional authority
- P2: High ALV → legitimacy-centric AI delegation
- P3: GDE + ALV → hybrid authority structures
- P4: ABC moderates DALS → safer AI deployment
- P5: GAA → enhanced resilience, performance, and legitimacy

These propositions provide a **roadmap for empirical validation** and set the stage for multi-method studies in various industry and geopolitical contexts.

6.2 Managerial Implications

The conceptual insights of GADAT translate into practical guidance for managers of AI-enabled global supply chains facing geopolitical uncertainty.

6.2.1 Align Decision Authority with Geopolitical Exposure

Managers should map AI-driven decisions against geopolitical digital **exposure** to identify areas where human oversight is required. This allows firms to:

- Avoid delegating critical decisions to AI in politically sensitive jurisdictions
- Ensure compliance with trade, data, and AI regulations
- Maintain legitimacy with stakeholders, regulators, and governments

6.2.2 Invest in Algorithmic Buffering Capabilities

Firms should develop capabilities to protect and reconfigure AI systems, including:

- Modular AI architectures capable of jurisdictional switching
- Redundant algorithmic pipelines and secure data flows
- Hybrid governance structures enabling human override

These buffering capabilities reduce both operational and legitimacy risks while maintaining partial efficiency gains.

6.2.3 Pursue Geo-Algorithmic Ambidexterity

Managers should design dual authority structures**:**

- AI autonomy in legitimacy-safe regions to maximize efficiency
- Human or hybrid authority in politically sensitive zones to ensure compliance and legitimacy

This ambidextrous approach balances operational performance and political/institutional alignment, ensuring global supply chain resilience.

6.2.4 Scenario Planning and Contingency Design

Firms should integrate geopolitical scenario planning into their AI deployment strategies:

- Anticipate regulatory changes and sanctions
- Model decision reallocation responses under different geopolitical contingencies
- Prepare rapid adaptation protocols for AI-human authority reallocation

Scenario planning enhances both resilience and strategic foresight in fragmented global environments.

6.3 Research Agenda

GADAT opens multiple avenues for empirical investigation.

6.3.1 Multi-Case Comparative Studies

- Examine MNCs across geopolitical blocs (U.S., EU, China, India) to validate GDE, ALV, and DALS.
- Compare AI delegation practices in high versus low regulation industries.

6.3.2 Process Tracing of AI Authority Shifts

- Conduct longitudinal studies documenting how authority shifts occur during political shocks**.**
- Capture the role of ABC and GAA in mediating performance outcomes.

6.3.3 Survey-Based Studies

- Develop instruments to measure **LCD and GAA** across firms.
- Analyze relationships between legitimacy pressures, AI authority allocation, and performance metrics.

6.3.4 Cross-Theoretical Tests

- Compare GADAT with TCE, STS, and Contingency Theory models.
- Test GADAT's superior explanatory power regarding legitimacy-driven AI delegation.

6.3.5 Digital and Multi-Tier Supply Chains

- Investigate how AI delegation strategies vary across digital supply chains of varying maturity, including multi-tier supplier networks.
- Examine interactions between algorithmic opacity, regulatory complexity, and cross-border governance.

6.4 Summary of Contributions

In summary, this paper contributes:

1. Theory: Introduces GADAT, an integrative theory explaining legitimacy-driven shifts in AI delegation under geopolitical fragmentation.
2. Concepts: Develops six new constructs operationalizing political exposure, legitimacy vulnerability, decision reallocation, buffering capabilities, and ambidexterity.
3. Propositions: Provides five testable propositions linking constructs to supply chain resilience, performance, and legitimacy outcomes.
4. Managerial Insights: Offers actionable guidance for mapping AI authority, developing buffering capabilities, and designing ambidextrous structures.
5. Research Directions: Outlines a multi-method research agenda spanning case studies, surveys, process tracing, and theory testing.
6.

Conclusion of Section 6:

GADAT advances theory by demonstrating that AI delegation is no longer merely a tool for operational efficiency but a strategic mechanism shaped by legitimacy, political exposure, and institutional pressures. By integrating RDT, IT, IPT, and DCV, GADAT explains the adaptive reconfiguration of AI-human decision authority across geopolitically fragmented supply chains. The model provides a foundation for both future empirical research **and** strategic managerial decision-making, addressing the pressing challenges of the modern global supply chain landscape.

7. CONCLUSION AND THEORETICAL SUMMARY

The global supply chain landscape is undergoing profound transformation at the intersection of AI-driven decision-making **and** geopolitical fragmentation. Traditional frameworks in supply chain management have largely emphasized efficiency, risk mitigation, or information-processing considerations. However, recent developments—ranging from trade sanctions and regulatory divergence to friend-shoring and digital sovereignty laws—have introduced a legitimacy dimension that fundamentally reshapes how decision authority is allocated between humans and AI systems.

This paper advances Geo-Algorithmic Decision Authority Theory (GADAT), a new integrative conceptual framework designed to explain this emerging phenomenon. GADAT addresses a critical theoretical gap: the lack of a cohesive model linking geopolitical exposure, legitimacy pressures, algorithmic decision delegation, and organizational adaptation. By integrating Resource Dependence Theory (RDT), Institutional Theory (IT), Information Processing Theory (IPT), and Dynamic Capabilities (DCV), the theory explicates how multinational corporations (MNCs) strategically reconfigure AI–human decision architectures to balance efficiency, resilience, and legitimacy.

7.1 Key Theoretical Insights

1. Shift from Efficiency- to Legitimacy-Centric Delegation:
   AI delegation in global supply chains is no longer driven solely by operational efficiency. Firms now prioritize legitimacy considerations—regulatory compliance, political acceptability, and societal endorsement—particularly in geopolitically sensitive regions. This shift challenges prior assumptions in the literature that AI authority naturally expands as algorithms outperform human decision-makers (Culot et al., 2024; Ivanov & Dolgui, 2022).
2. Introduction of Novel Constructs:
   GADAT introduces six constructs, Geopolitical Digital Exposure (GDE), Algorithmic Legitimacy Vulnerability (ALV), Decision Authority Locus Shift (DALS), Algorithmic Buffering Capabilities (ABC), Legitimacy-Centric Delegation (LCD), and Geo-Algorithmic Ambidexterity (GAA), each providing measurable dimensions for future research. These constructs

allow researchers to capture the nuanced interplay of political, institutional, and operational forces that shape AI-human decision architectures.

3. Dynamic and Ambidextrous Adaptation:
   Firms achieve resilience and strategic alignment by developing **geo-algorithmic ambidexterity**, maintaining AI autonomy in politically safe zones while employing human oversight or hybrid authority in sensitive regions. This ambidextrous logic is enabled by algorithmic buffering capabilities**,** highlighting the role of dynamic capabilities in safeguarding both legitimacy and efficiency under uncertainty.
4. Integrative Explanatory Power**:**
   Unlike rival theories—TCE, STS, or Contingency Theory, GADAT simultaneously explains why, where, and how AI delegation is constrained by legitimacy pressures, while also accounting for dynamic adaptation and structural reconfiguration. The theory thus represents a conceptual advance in supply chain management by linking geopolitical, institutional, and technological considerations in a single explanatory model.

7.2 Managerial Implications

The conceptual framework provides several actionable insights for supply chain managers:

- Authority Mapping: Assess geopolitical digital exposure to determine where AI autonomy is appropriate and where human oversight is necessary.
- Hybrid Governance Design**:** Implement dual decision structures to balance operational efficiency with regulatory and political legitimacy.
- Capability Building: Develop algorithmic buffering capabilities—modular AI pipelines, jurisdictional switching, redundancy—to maintain decision integrity under geopolitical disruption.
- Scenario Planning**:** Integrate geopolitical contingencies into AI deployment strategies to anticipate and adapt to regulatory or political shocks.

By aligning AI decision authority with both operational and legitimacy considerations, firms can achieve resilient and strategically coherent global supply chains**.**

7.3 Research Agenda and Empirical Opportunities

GADAT provides a roadmap for multiple empirical research designs:

1. Multi-Case Studies**:** Examine MNCs across regions to test the impact of GDE and ALV on authority allocation.
2. Process Tracing**:** Investigate how AI-human decision structures shift in response to geopolitical shocks.
3. Survey Research: Develop instruments measuring LCD, ABC, and GAA and their relationships to performance outcomes.
4. Comparative Theory Testing**:** Evaluate GADAT against TCE, STS, and Contingency Theory to demonstrate its superior explanatory power.
5. Industry and Supply Chain Tier Analysis: Assess how AI delegation strategies vary across sectors and multi-tier supplier networks.

These avenues provide a rich empirical agenda for validating the theory and advancing knowledge on AI-enabled, geopolitically sensitive supply chains.

7.4 Limitations and Boundary Conditions

While GADAT offers significant conceptual contributions, several limitations should be acknowledged:

- The theory is conceptual and has not yet been empirically tested; quantitative and qualitative validation is required.
- Its primary focus is on MNCs operating AI-enabled global supply chains, limiting direct generalizability to small firms or local supply chains.
- GADAT assumes rational organizational behavior and access to AI resources, which may not hold in all contexts.
- The influence of cultural, social, or technological variations across regions warrants further study.

These limitations define clear opportunities for empirical research to refine and extend the theory.

7.5 CONCLUSION

In conclusion, this paper addresses a pressing theoretical and managerial problem: how to allocate decision authority in AI-enabled global supply chains under conditions of geopolitical fragmentation. Through GADAT, the paper advances:

- A new theoretical lens for legitimacy-centric AI delegation.
- Six novel constructs operationalizing political exposure, legitimacy vulnerability, and adaptive authority.
- A set of propositions and managerial insights to guide both empirical research and practical decision-making.

Strategic Reconfiguration of Decision Authority in AI-Driven Global Supply Chains under Geopolitical Fragmentation: Developing Geo-Algorithmic Decision Authority Theory (GADAT)

GADAT integrates insights from RDT, Institutional Theory, IPT, and DCV, offering an explanatory framework capable of bridging efficiency and legitimacy logics. In doing so, it sets the stage for a new research agenda on AI, governance, and resilience in complex global supply chains, ensuring that decision authority is aligned not only with operational performance but also with the political and institutional legitimacy required to operate sustainably in fragmented geopolitical environments. By highlighting the legitimacy-driven shift in algorithmic delegation, this paper contributes to conceptual theory, managerial strategy, and the emerging discourse on AI governance in supply chains, positioning GADAT as a foundational model for future studies in global operations management.

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